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ABSTRACT

A total of 24 children, meeting several criteria for being diagnosed as having an attention deficit disorder with hyperactivity, were selected for study. Children were assigned to one of three conditions: a meditation-training group, a progressive-muscle-relaxation group, or a waiting-list control group. Subjects in the training groups were seen on an individual basis for 20 minutes twice weekly for a period of 4 weeks. Meditating subjects sat with eyes closed, breathed slowly and deeply, and repeated the Sanskrit word "ahnam" ("nameless") first out loud and then silently for periods gradually increasing in duration from 2 to 8 minutes. Relaxing subjects tensed and relaxed hands, forearms, biceps, triceps, shoulders, stomach, thighs, and calves in periods increasing from 2 to 8 minutes. Results indicated that both the meditation-training and relaxation-training groups showed significant decreases in levels of impulsivity. No change in impulsivity was found in the control group. In the measures of selective deployment of attention and freedom from distractibility, only meditation training resulted in significant improvement. Parent rating scales reflected a significant improvement in the behavior of children in both the meditation-training and relaxation-training groups. The Locus of Control Scale failed to show significant changes over the course of the study for any of the groups. (Author/RH)

THE USE OF MEDITATION IN THE TREATMENT OF ATTENTION DEFICIT DISORDER WITH HYPERACTIVITY

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ABSTRACT

Twenty-four children, meeting several criteria for the diagnostic label Attention Deficit Disorder with Hyperactivity, were selected as subjects. They were assigned to one of three conditions: (1) a meditation training group, (2) a progressive muscle relaxation group, or (3) a waiting list control group. Subjects in the training groups were seen on an individual basis for twenty minutes twice weekly for a period of four weeks. The results indicated that both the meditation training and relaxation training groups showed significant decreases in levels of impulsivity. There was no change in the control group in impulsivity. In the measures of selective deployment of attention and freedom from distractibility, only the meditation training resulted in significant improvement. Parent rating scales reflected a significant improvement in the behavior of children in both the meditation training and relaxation training groups. The Locus of Control Scale failed to show significant changes over the course of the study for any of the groups.

THE USE OF MEDITATION IN THE TREATMENT OF ATTENTION DEFICIT DISORDER WITH HYPERACTIVITY

Attention deficits are now being identified as primary impairments in a large group of children who were formerly diagnosed under such labels as Hyperkinetic Reaction of Childhood, Hyperkinetic Syndrome, Hyperactive Child Syndrome, Minimal Brain Dysfunction, and others. The current diagnostic label, Attention Deficit Disorder with Hyperactivity, as specified in the Diagnostic and Statistical Manual - III, supercedes these previous labels and includes symptom clusters relating to inattention, impulsivity, and hyperactivity. The purpose of this study was to investigate the use of meditation as a treatment approach for such children. Meditation refers to a family of techniques which have in common "the systematic and continued focusing of the attention on a single target percept - for example, a mantra or sound - or persistently holding a specific attentional set toward all percepts or mental contents as they spontaneously arise in the field of awareness" (Goleman & Schwartz, 1976, p. 457).

Clinical Features

The key clinical signs of the disorder manifest themselves in different forms at various levels of development (Klein, Gittleman, Quitkin, & Rifkin, 1980). In younger children, gross motor activity is more conspicuous. These children move around considerably, are difficult to restrain, and are often reported to be up and down. As the child gets older, gross motor activity becomes less apparent, but assumes more subtle forms, such as restlessness, fidgitiness, and difficulty sitting in a chair. They are often impulsive to the extent that they will not consider the consequences of their behavior. In the school setting, these children have difficulty waiting to be called on, and may answer for others.

They may place themselves in more dangerous or risky situations, and may fail to appreciate all aspects of instructions given to them (Barkley, 1981). In addition, these children experience considerable difficulty sustaining attention, and often fail to persist in tasks for periods of time that are age appropriate. In the home, a child may fail to complete his homework assignments, to listen to directions when given, or to play for extended periods of time without supervision (Barkley, 1981). In school settings, such children often fail to complete assignments, have trouble attending to the teacher during lecture, and are often described as distractible.

Treatment Modalities

Various approaches have been employed in the treatment and management of hyperactive children. Perhaps the most common is the administration of stimulant medication. A large body of research on the clinical efficacy of stimulant drugs documents the positive short-term effects on measures of impulse control, attention span, and behavior problems (Barkley, 1977; Cantwell & Carlson, 1978; Cole, 1975). Taylor (1979) has noted that more than 30 controlled studies of stimulant medication have been reviewed several times with a similar conclusion that "some symptoms found in the hyperactive are diminished in the short term by stimulant drug treatment" (p. 952). Nevertheless, considerable controversy exists regarding the use of stimulants with hyperactive children.

Numerous studies have reported on the occurrence of short-term and possible long-term side effects of the medication. For example, common side effects with the use of Benzedrine include "a pale, pinched, serious facial expression with dark hollows under the eyes; anorexia; transient insomnia;

headache; and dryness of the mouth" (Laufer & Shetty, 1980, p. 2545). Similar effects are seen with Dexedrine. Side effects of Ritalin, the medication most commonly prescribed, include loss of appetite, tension, insomnia, and tachycardia (Cole, 1975), as well as increases in blood pressure (Cohen, Douglas, & Morganstern, 1971; Rapoport, Quinn, Bradbard, Riddle, & Brooks, 1974). In addition, height and weight suppression have been reported by Safer and Allen (1973), and by Safer, Allen, and Barr (1972).

Undesirable psychological side-effects such as irritability (Epstein, Lasagna, Connors, & Rodriguez, 1968), reduced social interactions with other children (Barkley & Cunningham, 1979), and psychotic episodes (Winsberg, Bialer, Kupietz, & Tobias, 1972; Klein et al., 1980) have also been reported. Additionally, in some hyperactive children, not only does the effect wear off, but also a significant deterioration in behavior follows so that the child's behavior is worse than before treatment. This "rebound" phenomena has been described by Klein et al. (1980).

These considerations and others have generated interest in alternative forms of treatment for the disorder. Numerous studies have demonstrated the short-term effectiveness of various behavior modification and cognitive training techniques (Ayllon, Laymen, & Kandel, 1975: Christensen & Sprague, 1973; Doubros & Daniels, 1966; Kendall & Finch, 1978; Loney, Weissenburger, Woolson, & Lichty, 1979; Meichenbaum, 1979; Pihl, 1967; Quay, Sprague, Werry, & McQueen, 1967). Some researchers have found promising results in training hyperactive children to control internal physiological processes such as alpha rhythm, heart rate, muscle action potentials, and finger temperature (Sulzbacher, 1975; Cobb & Evans, 1981). Other

studies combined biofeedback with relaxation training, using either tapes or instruction in progressive muscle relaxation (Anderson, 1976; Braud, 1975, 1978; Dunn & Howell, 1982; Rivera, 1978; Walton, 1979). Still others have examined the utility of progressive muscle relaxation or large muscle exercise as a singular treatment modality for hyperactivity (Brown, 1977; Klein & Deffenbacher, 1977).

Meditation

Meditation has been defined in various ways. Current research emphasizes the role of attentional mechanisms in defining the technique. For example, Shapiro (1982) describes meditation as "a family of techniques which have in common a conscious attempt to focus attention in a nonanalytical way and an attempt not to dwell on discursive, ruminating thought" (p. 268). Goleman and Schwartz (1976) note that "meditation per se is the self-regulation of attention, not of belief or cognitive processes" (p. 457). There seems to be a consensus, as Shapiro and Giber (1978) have proposed, that meditation can produce a state of relaxation. Certain physiological changes have been consistently reported during the act of meditation including "reduced heart rate, decreased oxygen consumption, decreased blood pressure, increased skin resistance, and increased regularity and amplitude of alpha activity" (Shapiro & Giber, 1978, p. 296).

Early research claimed that the physiological correlates of meditation were unique to the practice of meditation (Banquet, 1972; Orme-Johnson, 1973; Wallace, 1970; Wallace, Benson, & Wilson, 1971). Later, this view was questioned. Benson (1975) and Benson, Beary, and Carol (1974) argued that the physiological concomitants of meditation were characteristic of any passive relaxation strategy. Subsequent studies appeared that found no difference between meditation and other self-regulation strategies in terms of heart rate, respiration rate or galvanic skin response (Shapiro, 1982).

Different forms of meditation have been practiced for centuries, particularly in the East (Murray, 1982). Yoga has been an integral feature of the Hindu culture for over 2,000 years. Zen meditation is an essential part of both the Soto and Rinzai sects of Zen Buddhism. It is a more highly standardized technique than the various Yogic methods (Woolfolk, 1975). Transcendental meditation (TM) is a technique adapted from the Indian Yogic tradition. It is less rigorous, easily learned, and practiced widely in the United States and Europe. Reports indicate that since 1965, over one million Americans have learned to meditate (Murray, 1982). Until recently, most of the published research on meditation has employed the method of TM. Benson (1975) has developed the relaxation response technique, which is almost identical to the TM method, except that there are no philosophical underpinnings. Also the word "one" is substituted for the mantram. The remaining procedural elements are the same.

Linden (1973) conducted the only controlled study to appear in the literature that examined the use of meditation with school-age children. The results indicated that compared to a guidance group and a no-treatment control group, children who practiced meditation became more field independent, and less test anxious. With regard to field independence, the subjects had learned to "focus and refocus their attention and to disregard intrusions by distracting stimuli" (p. 142).

METHOD

Subjects

Twenty-four children served as subjects. Most of the children were referred by school psychologists and special education teachers. In addition, parents of several children responded to a notice describing the study which appeared in a local newspaper. The criteria for inclusion in the study were the following: subjects (1) were male, between the ages of 7 and 12; (2) met the diagnostic indices as specified for Attention Deficit Disorder with Hyperactivity (DSM-III), based on parent and child interview; (3) were rated as hyperactive by his parent, as defined by a minimum score of 15 on the Abbreviated Parent-Teacher Questionnaire; (4) were free from neurological disease or psychosis; and (5) had informed consent of the parent or legal guardian. In order to achieve the appropriate sample size, it was necessary to include subjects who were receiving stimulant medication. Because it was deemed inappropriate to request that they discontinue the use of medication, those subjects were assigned to each condition in a modified random fashion such that they were represented in approximately equal numbers in each condition. This group totaled eight subjects. In the final sample, ages ranged from 93 months to 142 months (M = 120.6).

Measures

The Matching Familiar Figures Test (MFFT), developed by Kagan (1966), was used to measure the dimension of reflection-impulsivity. This dimension described the tendency to reflect on the validity of problem solving when several possible alternatives are available, and there is some uncertainty over which one is the most appropriate (Messer, 1976). Thus,

children who respond quickly often make errors (impulsives), while those who pause to reflect on response alternatives are more often correct (reflectives). The MFFT is a 12 item match-to-sample task that requires the child to choose from an array of six variants the one picture that is identical to the standard picture. Kendall and Finch (1978) found that the short-term test-retest correlations for latency and errors were .72 and .82 respectively, after four weeks, and .78 and .62 after eight weeks.

The Fruit Distraction Test (FDT), developed by Santostefano (1978), was used to assess the manner in which the child dealt with a stimulus field that contains information defined as relevant and irrelevant. "The hallmark of this control . . . is selective deployment of attention . . . " (Santostefano, 1978, p. 431). The materials consist of four test cards and three practice cards used to train the child in the test requirements. Basically, the child is asked to name colors presented with and without distractions and contradictions. Reliability correlations, ranging from .51 to .71 have been reported (Santostefano, 1978; Zarembo, 1967).

The Nowicki-Strickland Locus of Control Scale (LCS), developed in 1973 by Nowicki and Strickland, was used to assess changes in the dimension of locus of control. The scale consists of 40 questions that are answered yes or no, and was constructed on the basis of Rotter's definition of the internal-external control of reinforcement dimension (Nowicki & Strickland, 1973). An estimate of internal consistency via the split-half method was found to be .63, and test-retest reliabilities of .63 and .66, six weeks apart, have been reported (Nowicki & Strickland, 1973).

The Abbreviated Parent-Teacher Questionnaire (PTQ) was developed by Connors (1973) and consists of 10 overlapping

items from the Connors Teacher Rating Scale and the Parent Symptom Questionnaire. Sprague and Sleator (1973) found the scale to be reliable in identifying hyperactive children, and sensitive in assessing the effects of drugs on children's behavior. "A total score of 15 has been established as the point that confirms the presence of hyperactivity since it is very much above the scores received by normal children" (Klein et al., 1980, p. 605).

The Werry-Weiss-Peters Activity Scale (WWPAS), developed in 1968, provides a means of assessing activity level in specific situations, such as during meals, television viewing, homework, and play. Items are rated on a three-point scale. A correlation of .90 between raters has been reported (Werry, Weiss, Douglas, & Martin, 1966).

Procedure

Each child was seen with his parent or legal guardian for an initial interview and preliminary assessment. Those children accepted, based on criteria previously described, were randomly assigned to one of three conditions: (1) Meditation Training (MT), (2) Relaxation Training (RT), and (3) Waiting List Control (WLC). Assessment measures were administered individually one week prior to the onset of the assigned condition. Each condition lasted four weeks and was followed by post-treatment evaluation in the fifth week.

Subjects assigned to the Meditation Training (MT) condition met individually with the experimenter for 20 minutes twice weekly for a four-week period, for a total of eight training sessions. The type of meditation taught was derived from the work of Benson (1975) and Carrington (1978). Subjects sat in a comfortable position on a padded, straight-back chair. To begin, they were asked to close their eyes and to take deep,

slow breaths. The experimenter modeled the appropriate technique. Then, following his example, the subjects repeated the word "Ahnam" (a Sanskrit word which means "nameless") out loud, becoming progressively softer with each repetition, until the word was repeated silently. The word "Ahnam" was chosen for its resonating quality, and because it does not have common associations, as does the word "one" that Benson recommends. Subjects were instructed to return to repeating the word should they find themselves lost in thought, or aware that they had ceased to repeat the word. They were asked to maintain a passive attitude and to sit quietly for 15 to 20 seconds following completion of the exercise. Any difficulties they experienced were explained and corrected in a brief discussion after the meditation. They were asked to practice the technique at least three times per week at home, and to record the day and time of this practice on the checklist provided. The length of the meditation itself was gradually increased from approximately two minutes to approximately eight minutes by the end of the four week training period. Following the second week of training, parents of the children were seen individually for one session to discuss and learn the meditation procedure themselves. In this way, they could act as resource persons for the children if the need arose.

Subjects in the Relaxation Training (RT) condition met individually with the experimenter for the same amount of time each week as the MT condition. They were instructed in the technique of progressive muscle relaxation, as described by Wolpe and Lazarus (1966). The instructions were modified to make them more appropriate for children. The modifications consisted of (1) a reduction in the number of muscle groups in the tension-relaxation cycle (included were, in sequence, the hands, forearms, biceps, triceps, shoulders, stomach,

thighs, and calves), (2) the inclusion of a deep, slow breathing phase both before and after the tension-relaxation cycles, and (3) a five-second tension period, rather than the ten seconds more commonly used. The behaviors were modeled by the experimenter and were taught so that the children could practice on their own. They were encouraged to discuss their experience immediately following each session and were asked to practice and record their practice periods at home in the same manner as the MT group. Similarly, their sessions of actual training were increased from two to eight minutes, and their parents were taught the method during the second week of training, to insure comparability to the MT group.

Subjects in the Waiting List Control (WLC) condition were informed that they would begin their relaxation training procedure in approximately four weeks, corresponding to the length of the actual training procedures. They were contacted after three weeks to arrange for an appointment. Otherwise, they received no experimental manipulation. After the four week waiting period, they began meditation training identical to the experimental group.

A single experimenter met with all children and parents in all three groups.

Experimental Hypotheses

Since the use of meditation was a novel treatment technique with the population studied, it was decided to compare its effects to that of a technique that has received considerable study - progressive muscle relaxation - and to a waiting list control. An attention-placebo group was not used, as it was considered undesirable to offer a non-treatment situation, particularly in the context of a community health center where the study was conducted.

It was expected that both training groups, as compared to the waiting list control, would exhibit decreases in levels of impulsivity, a greater sense of internal control over behavior and improved behavior at home. The meditation training group alone was expected to exhibit more selective deployment of attention. A final hypothesis, regarding improved behavior in the classroom, had to be discarded as these data were incomplete and not conforming to the standards established at the outset of the experiment.

RESULTS

In order to evaluate changes in the dependent measures for subjects in the treatment and control groups across the two time periods, separate two-factor split plot analyses of variance were conducted for each dependent measure. The between factor was group, having three levels (MT, RT, and WLC), and the within factor was testings, having two levels (pretest and posttest).

Impulsivity

An ANOVA was performed on the MFFT error scores and is presented in Table 1. This analysis revealed a significant Group X Testing interaction, $F(2,21) = 7.16$, $p = .004$. This interaction was analyzed in further detail using Tukey's HSD procedure. Results indicate that error scores on the MFFT showed a significant decrease for both the MT ($p<.01$) and the RT ($p<.05$) groups. Scores from the WLC group did not demonstrate significant differences between pretest and posttest. In terms of MFFT latency scores, an ANOVA yielded no significant treatment group or interaction effects.

Selective Deployment of Attention

Separate analyses of variance were performed on the FDT error scores for Cards I through IV. For Card I, the analysis yielded no significant interaction effects. For Card II, the analysis revealed a trend, although non-significant, toward a Group X Testing interaction effect, $F(2,21) = 2.92$, $p = .076$, with the MT group having the largest decrease in errors between pretest and posttest. For Card III, the analysis revealed a significant Group X Testing interaction, $F(2,21) = 3.89$, $p = .037$, which appears in Table 2. Using Tukey's HSD procedure, this interaction was analyzed further. Results indicate that error scores on Card III showed a significant decrease only for the MT group ($p<.01$). Similarly, Card IV revealed a significant Group X Testing interaction, $F(2,21) = 5.87$, $p = .009$, which appears in Table 3. Tukey's post hoc comparison of group means revealed that only the MT group showed a significant decrease in the number of errors from pretest to posttest ($p<.01$). Additionally, separate analyses of variance were performed on the FDT latency scores for Cards I through IV. No significant Group X Testing interaction effects were evident.

Locus of Control

It was expected that both the RT and MT groups would demonstrate a greater sense of internal control over their behavior following treatment conditions as compared to the WLC group. The ANOVA performed on the LCS scores indicated no significant differences between the groups.

Behavior at Home

In order to determine if there had been a change in behavior at home, as rated by their parents, two rating scales were used. An ANOVA performed on the PTQ scores is summarized

in Table 4. This analysis revealed a significant Group X Testing interaction, $F(2,21) = 3.70$, $p = .042$. Further Analysis using Tukey's procedure revealed that both the MT and RT groups showed significant improvement ($p<.05$, $p<.01$, respectively). The behavior of the WLC group was not rated as changed to a significant degree.

Similarly, an ANOVA was performed on the WWPAS scores and is presented in Table 5. This analysis yielded a significant Group X Testing interaction, $F(2,21) = 6.78$, $p = .005$. Tukey's post hoc contrast of group means indicated that both the MT and RT groups showed significant improvement ($p<.01$), whereas the WLC group failed to improve.

DISCUSSION

The results of the study support the contention that meditation can be an effective intervention in the treatment of children diagnosed as having an Attention Deficit Disorder with Hyperactivity. Further, it lends support to the utility of the progressive muscle relaxation approach in the treatment of such children, as has been noted previously by various researchers. Both techniques resulted in significant decreases in error scores on the MFFT, an indication of a decrease in impulsivity. Thus, when confronted with a problem solving task, the children were able to review the stimulus field more carefully and efficiently before responding.

As predicted, only the meditation group showed an improvement in the selective deployment of attention, as measured by the FDT. The data suggest that the subjects had learned to focus and refocus their attention. Thus, rather than employing attention in an indiscriminate manner to all information, there was a discernible shift to a more selective use

of attention. That is, subjects were able to withhold attention from irrelevant and periperal information and to direct attention to information defined as relevant to the task at hand. These were the skills required on Cards III and IV of the FDT. It is worth noting that of the four Cards on the instrument, the two presenting the most distracting stimuli are Cards III and IV; Card I is essentially a baseline measure. These general findings lend additional support to the earlier work of Linden (1973) with normal school-age children.

The hypothesis that hyperactive children would develop a greater sense of internal control over behavior as a result of either training condition was not supported. One possible explanation is that locus of control may be a more stable characteristic than expected. Therefore, it may be that a much longer training period would be necessary in order to obtain a significant treatment effect, if there is to be any effect at all. Additionally, there were some difficulties with the locus of control scale that was used for this group. Many of the questions were worded in a manner that was confusing to the children. The relationship between impulsive behavior and locus of control has been questioned by several authors and remains to be investigated further (Ayabe, 1979; Berzonsky, 1974; Massari, 1975; McNary, Michael, Richards, & Lovell, 1975).

The achievement of a generalization of behavior to a non-treatment setting has been a major problem for most of the studies of intervention with hyperactive children. As Kazdin (1975) has noted, "Typically, behavior changes are restricted to the specific setting in which training has taken place and to the presence of those who administer the program" (p. 215). The results of this study do support the hypothesis which predicted that children in both training conditions would demonstrate improved behavior at home, based on the two parent rating scales. Apparently, parents experienced

a significant improvement in their child's general behavior and attitudes. There were gains noted in specific areas as well. For example, the 'homework' and 'behavior during meals' items of the WWPAS reflected marked gains over the course of the training period, particularly for the meditation group.

Theoretical Assumptions

The meditation technique used in this study simultaneously addressed the heightened activity levels and the attentional deficits characteristic of hyperactive children. It incorporated both the physiological changes reflective of a relaxed state, as biofeedback and relaxation training have stressed, and training in attention deployment. A basic underlying assumption is that a relaxed physiological state is incompatible with hyperactivity. In addition, attention is a multi-behavioral process that is incompatible with hyperactive behavior, as noted by Ablasio (1972) and Simpson and Nelson (1974). It is postulated that the focusing of attention inherent in the meditation technique facilitates the production of a relaxed state, which in turn facilitates the training of attention, as in a closed feedback loop. Additionally, managing distractions and intrusions becomes a means of increasing inhibitory controls over behavior in general. In effect, more discrimination is employed in responding to stimuli.

Qualitative Analysis: Anecdotal Comments of Participants

Many interesting comments were made by the participants in the study. One youngster said about the meditation technique, "It's very interesting. It makes it seem more quieter, and there's nothing bothering you. You feel sleepy, calm, and relaxed at the same time." Another boy stated, "My mind was all clean and very comfortable, like my mind had nothing in it. I was only thinking of that word. I blocked out

everything else. My mind was like white. No thoughts." One youngster rather enthusiastically noted, "It's a miracle. I never stayed that calm for so long in my whole life. If I didn't do it, I would be jumpy right now." Another stated, "It helps me in school. I can ignore the distractions of the other kids making noise, and then I get down to my work." One child reported he was able to make up 22 homework assignments because he could finally sit and work on them without feeling so restless and fidgety.

It is also worth noting that several children reported that they used the meditation technique to help them sleep at night. In fact, one child who used to bang his head repetitively against the pillow before he could fall asleep, found the technique so helpful that the head banging was eliminated.

For the most part, parents of children in the study were quite supportive. They commented on their child's increased ability to sit quietly, to complete homework assignments, and to focus their attention. Some parents expressed relief at having a 'tool' to use to help their child calm down or be more in control of their behavior. The fact that this was a non-medical intervention was an important factor for a number of parents, as there was a good deal of fear and reluctance to place their child on medication, which had been recommended for many of the children.

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Table 1

ANOVA For MFFT Errors

Source	df	Sum of squares	Mean Square	F	Prob.
Group	2	15.167	7.583	0.27	0.769
Error 1	21	597.500	28.452		
Testing	1	140.083	140.083	21.99	0.0001
Grp X Test	2	91.167	45.583	7.16	0.004
Error 2	21	133.750	6.369		

Table 2

ANOVA For FDT Errors (Card III)

Source	df	Sum of squares	Mean square	F	Prob.
Group	2	14.292	7.146	0.72	0.4988
Error 1	21	208.687	9.937		
Testing	1	54.187	54.187	10.37	0.0041
Grp X Test	2	40.625	20.312	3.89	0.0366
Error 2	21	109.687	5.223		

Table 3

ANOVA For FDT Errors (Card IV)

Source	df	Sum of squares	Mean square	F	Prob.
Group	2	20.042	10.021	1.05	0.3668
Error 1	21	199.937	9.521		
Testing	1	15.187	15.187	3.08	0.0937
Grp X Test	2	57.875	28.937	5.87	0.0094
Error 2	21	103.437	4.926		

Table 4

ANOVA For PTQ Scores

Source	df	Sum of squares	Mean square	F	Prob.
Group	2	47.542	23.771	0.92	0.412
Error 1	21	539.937	25.711		
Testing	1	204.187	204.187	20.55	0.0002
Grp X Test	2	73.625	36.812	3.70	0.0419
Error 2	21	208.687	9.937		

Table 5

ANOVA For WWPAS Scores

Source	df	Sum of squares	Mean square	F	Prob.
Group	2	153.875	76.937	0.64	0.5391
Error 1	21	2538.937	120.902		
Testing	1	487.687	487.687	16.70	0.0005
Grp X Test	2	396.375	198.187	6.78	0.0053
Error 2	21	613.437	29.211		